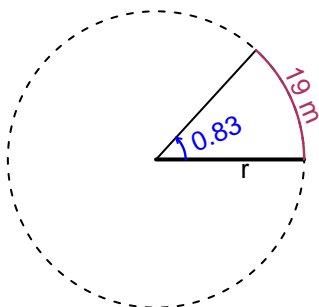# Trig Final (Solution v4)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 0.83 radians. The arc length is 19 meters. How long is the radius in meters?
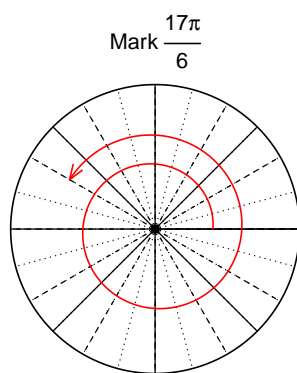

$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$
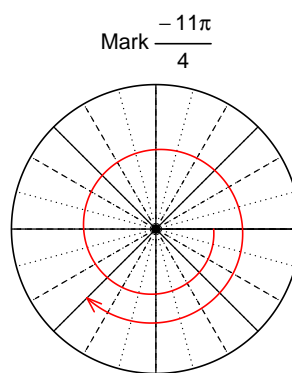
$r = 22.89$ meters.

Question 2

Consider angles $\frac{17\pi}{6}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{17\pi}{6}\right)$ and $\sin\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{17\pi}{6}$

Find $\cos(17\pi/6)$

Mark $\frac{-11\pi}{4}$

Find $\sin(-11\pi/4)$

$\cos(17\pi/6) = \frac{-\sqrt{3}}{2}$
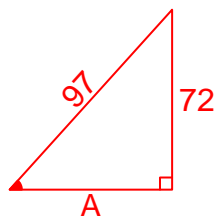
$\sin(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-72}{97}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

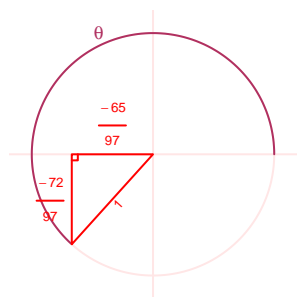Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.

Solve the Pythagorean Equation

$$A^2 + 72^2 = 97^2$$
$$A = \sqrt{97^2 - 72^2}$$
$$A = 65$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.

$$\tan(\theta) = \frac{\frac{-72}{97}}{\frac{-65}{97}} = \frac{72}{65}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -7.33$ meters, an amplitude of 6.09 meters, and a frequency of 8.74 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.09 \cos(2\pi 8.74 t) - 7.33$$

or

$$y = -6.09 \cos(17.48\pi t) - 7.33$$

or

$$y = -6.09 \cos(54.92 t) - 7.33$$